Grid PV Inverter

CMS 1500

CMS 2000

CMS 2800

Installation and Operation Manual

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Before you start

Congratulations on choosing CMS Grid PV Inverter, the products from CMS Grid PV Inverter are a highly reliable products due to their innovative design and perfect quality control. Such inverters are used in high demand, grid-linked PV systems.

This manual contains important information regarding installation and safe operation of this unit. Be sure to read this manual carefully before using.

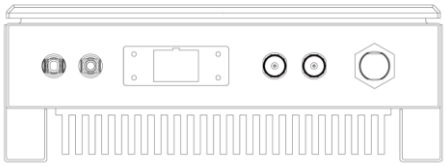
If you encounter any problems during installation or operation of this unit, first check this manual before contacting your local dealer or representative. Instructions inside this manual will help you solve most installation and operation difficulties.

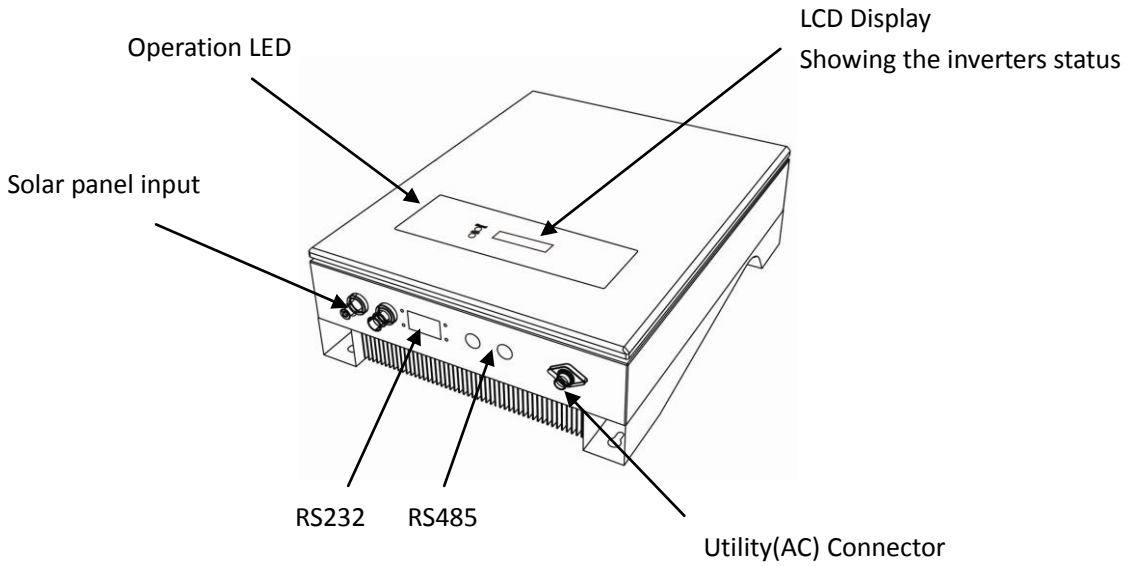
1. Content

CMS 1500, CMS 2000 and CMS 2800 Design Overview

Front View

Bottom View





Opening the package

After opening the package, please check the contents of the box. It should contain the following:

Item	Name	Quantity
1	CMS 1500/2000/2800	1
2	Mounting frame	1
3	Mounting screws	4
4	Safety-lock screws	2
5	AC socket assembly	1
6	Instruction manual	1
7	Monitor software(disk)	1 (Optional)

Before starting installation please consider the following items:

This unit is designed for outdoor usage（IP65）. Do not expose the PV-Inverter to direct sunlight. Direct sunlight increases the internal temperature that may reduce conversion efficiency.

- ✓ Check the ambient temperature of installation is within specified range -20 ~ +55℃
- ✓ The AC grid voltage is between 190 and 260VAC, 50Hz.
- ✓ Qualified personnel are performing the installation.
- ✓ Adequate convection space surrounds the inverter.
- ✓ Inverter is being installed away from explosive vapors.
- ✓ No flammable items are near the inverter.

it is recommended that Inverter is installed where the ambient temperature is between 0~40℃

2. Installation

1) Safety instructions

A. Do not remove the casing. Inverter contains no user serviceable parts. Refer servicing to qualified service personnel.

B. Both AC and DC voltage sources are terminated inside the PV Inverter. Please disconnect these circuits before servicing.

C. When a photovoltaic panel is exposed to light, it generates a DC voltage. When connected to this equipment, a photovoltaic panel will charge the DC link capacitors.

D. Energy stored in this equipment's DC link capacitors presents a risk of electric

shock. Even after the unit is disconnected from the grid and photovoltaic panels, high voltages may still exist inside the PV-Inverter. Do not remove the casing until at least 10 minutes after disconnecting all power sources.

E. This unit is designed to feed power to the public power grid (utility) only. Do not connect this unit to an AC source or generator. Connecting Inverter to external devices could result in serious damage to your equipment.

F. Carefully remove the unit from its packaging and inspect for external damage. If you find any imperfections, please contact your local dealer.

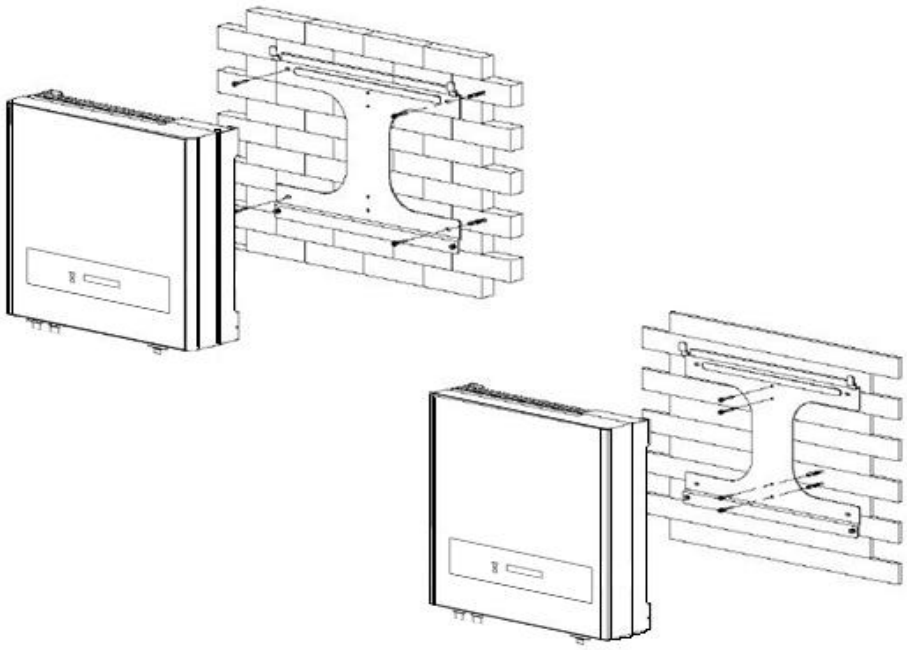
G. Although designed to meet all safety requirements, some parts and surfaces of Inverter are still hot during operation. To reduce the risk of injury, do not touch the heat sink at the back of the PV-Inverter or nearby surfaces while Inverter is operating.

2) Fixed on the wall

A. Select a wall or solid vertical surface that can support the PV-Inverter.

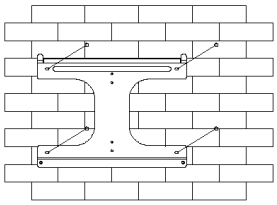
B. Inverter requires adequate cooling space. Allow at least 20cm space above and below the inverter.

C. Using the mounting frame as a template, drill 4 holes as illustrated in the following figures.



D. Fix the mounting frame as the figure shows. Do not make the screws to be flush to the wall. Instead, leave 2 to 4mm exposed.

E. Hang the inverter on the mounting frame

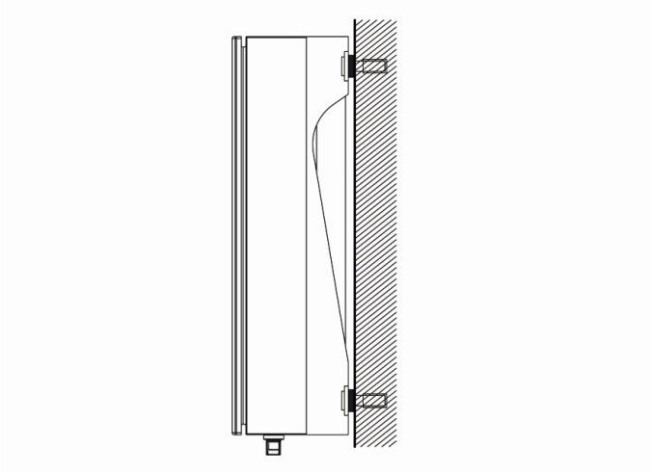


F. Check the installation conditions

a) Do not install the PV-Inverter on a slanted surface

b) Check the upper straps of PV-Inverter and ensure it fits on to the bracket

c) Insert safety-lock screws to the bottom leg to secure the inverter.



d) Check the secure mounting of the PV-Inverter by trying to raise it from the bottom. The PV-Inverter should remain firmly attached.

e) Select the installation location so that the status display can be easily viewed.

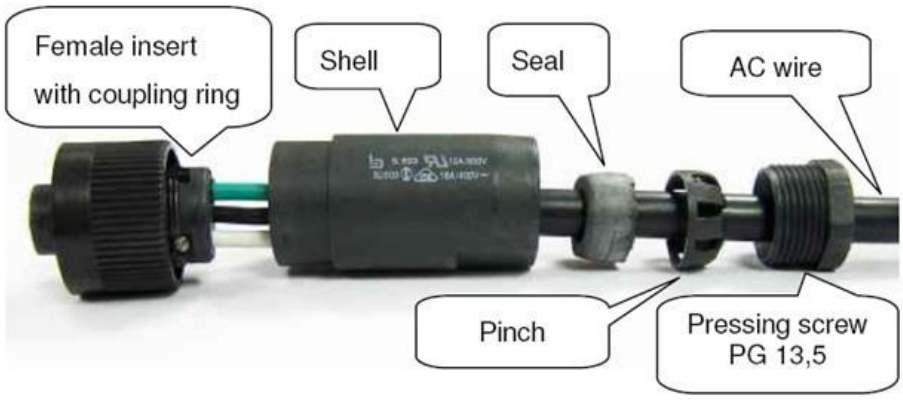
f) Choose a strong mounting wall to prevent vibrations while inverter is operating.

3) Connecting to the grid (AC utility)

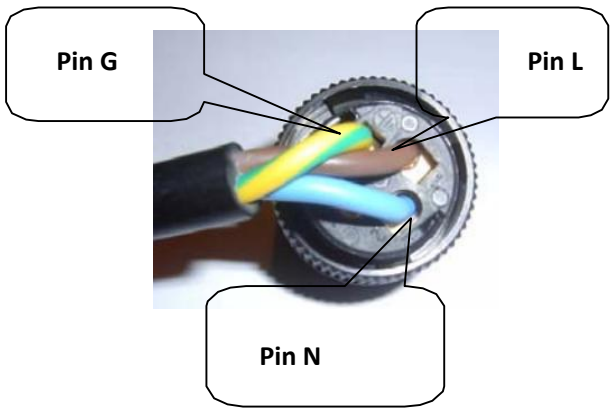
A. Measure grid (utility) voltage and frequency. It should be 230VAC (or 220VAC) , 50Hz and single phase.

B. Open the breaker or fuse between PV Inverter and utility.

C. For Inverter (CMS 1500, 2000 or 2800), connect AC wires as follows:



- Insert utility wires through cable gland. Connect wires according to polarities indicated on terminal block. L→LINE (brown or black), N→Neutral (blue) and G→system ground (yellow-green).
- Fasten the gland plate with attached screws.
- Twist the gland so that the cable is firmly fixed.
- Refer to left figure.
- Insert Line wire to Pin L, Neutral wire to Pin N and Ground wire to Pin G.



- Suggested cable width for AC wire

Model	Φ(mm)	Area(mm^2)	AWG no.
CMS 1500	⩾1.29	⩾1.5	⩽16
CMS 2000	⩾1.29	⩾1.5	⩽16
CMS 2800	⩾1.63	⩾2.0	⩽14

4) Connect to PV Panel (DC input)

A. CMS 1500: Make sure the maximum open circuit voltage (Voc) of each PV string

is less than 450VDC UNDER ANY CONDITION.

B CMS 2000/2800: Make sure the maximum open circuit voltage (Voc) of each PV string is less than 500VDC UNDER ANY CONDITION.

C. Use MC (Multi-contact) connectors for PV array terminals.

D. Connect the positive and negative terminals from the PV panel to positive (+) terminals and negative (-) terminals on the PV-Inverter. Each DC terminal on Inverter can withstand 20A_{DC}.

E. Before connecting PV panels to DC terminals, please make sure the polarity is correct. Incorrect polarity connection could permanently damage the unit. Check short-circuit current of the PV string. The total short-circuit current of the PV string should be less than the inverter's maximum DC current.

F. High voltages exist when the PV panel is exposed to the sun. To reduce risk of electric shock, avoid touching live components and treat connection terminals carefully.

5) Check

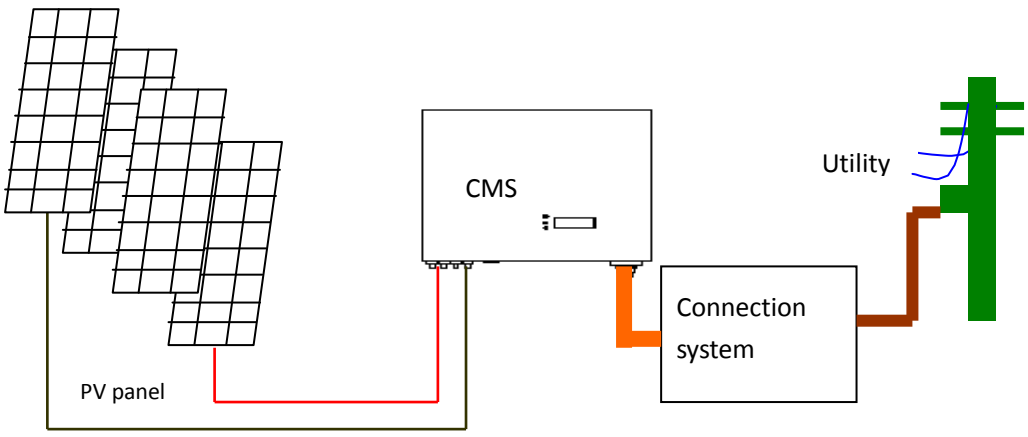
A. When the PV panels are connected and their output voltage is greater than 100 VDC but the AC grid is not yet connected, the message on the LCD display produce the following messages in order: "MODEL= XkW"-> "Waiting" -> "Disconnect grid". The display repeats "Disconnect grid" and the RED "fault LED" turns on.

B. Close the AC breaker or fuse between PV-Inverter and grid. The normal operating sequence begins.

C. Under normal operating conditions the LCD displays "Pac=xxxx.xW". That is the power fed to the grid. The green LED turns lights-up.

D. This completes the check.

6) System Diagram



A. **PV Panel:** Provide DC power to inverter

B. **CMS:** Converts DC (Direct Current) power from PV panel(s) to AC (Alternating Current) power. Because Inverter is grid-connected it controls the current amplitude according to the PV Panel power supply. Inverter always tries to convert the maximum power from your PV panel(s).

C. **Connection system:** This "interface" between Utility and PV-Inverter may consist of electrical breaker, fuse and connecting terminals. To comply with local safety standards and codes, the connection system should be designed and implemented by a qualified technician.

D. **Utility:** Referred to as "grid" in this manual, is the way your electric power company provides power to your place. Please note that Inverter can only connect to low-voltage systems (namely, 220～230VAC, 50Hz).

3. Modes of operation

There are 3 different modes of operation.

1) Normal mode:

In this mode, Inverter works normally. Whenever the supplied power from PV panel is sufficient (voltage>150VDC), Inverter converts power to the grid as generated by the PV panel. If the power is insufficient (voltage<100VDC).Inverter enters a "waiting" state. Whilst "waiting" Inverter uses just enough power from the PV panel monitor internal system status. In normal mode the green LED is on.

2) Fault mode

The internal intelligent controller can continuously monitor and adjust the system status. If Inverter finds any unexpected conditions such as grid problems or internal failure, it will display the information on its LCD and light up the red "Fault" LED.

3) Shutdown mode

During periods of little or no sunlight, Inverter automatically stops running. In this mode, Inverter does not take any power from the grid. The display and LED's on the front panel do not work.

Notes

Operating Inverter is quite easy. During normal operation, Inverter runs automatically.

However, to achieve maximum conversion efficiency of Inverter please read the following information:

a. Automatic ON-OFF: Inverter starts up automatically when DC-power from the PV panel is sufficient. Once the PV-Inverter starts it enters one of the following 3 states:

- **Standby:** The PV string can only provide just enough voltage to minimum requirements of the controller.
- **Waiting:** When the PV string DC voltage is greater than 100V, Inverter enters a "waiting" state and attempts to connect to the grid.
- **Normal operation:** When PV string DC voltage is greater than 150V, Inverter operates in the normal state.

b. Starting-up display sequence: Once the PV power is sufficient, Inverter displays information as shown in the flow chart as follow:

"User: xxxx"→ "Spec:xxxx" → "Model:x.xkW" → "SW Version :xx.xx" → "Checking xxS" → "Normal State" → "Pac= xxx.x W".

c. LCD backlight control: To save power, the LCD display's backlight automatically turns off after 30 seconds.

- **LCD display**

The first line of LCD		
State	Display content	Remark
Wait State	Waiting	Initial waiting
	Checking xxS	System checking
	Reconnect in xxS	System checking
	Standby	PV voltage low
Normal State	Pac = xxxx.x W	Inverter watt at working
Auto Test State	Auto testing	Protection auto test
Fault State	System xx Fault	System fault
Permanent State	Inverter xx Damaged	Inverter fault
Program State	Programing	Update software

The second line of LCD		
Cycle display	Display time /s	Remark
User: xxxx	1	The user type
Spec: xxxx	1	The inverter spec type
Model:x.xkW	1	The inverter model
SW Version:xx.xx	1	The software version
Etotal: xxxkWh	2	The energy total
Etoday: xx.xkWh	2	The energy today
Ttoday:xxhxxmin	2	The work time today
PV:xxxV BUS:xxxV	2	The PV and Bus voltage

AC:xxxV xx.xHz	2	The Grid voltage and frequency

4. Inverter Status

Inverter is designed to be user-friendly; therefore, the status of the Inverter can be easily understood by reading the information shown on the front panel display. All possible messages are shown in the following table.

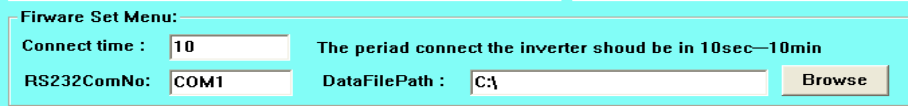
Display	Operation
System Fault	
Disconnect Grid	disconnect grid
Grid V Fault	grid voltage out range
Grid F Fault	grid frequency out range
Low Isolation	low input isolation
High PV Voltage	PV input voltage high
High Ground I	GFCI active
High Temperature	temperature too high
Inverter Fault	
EEPROM Damaged	EEPROM has problem
Please Initiate	System has not been initiated at the first time
GFCI Damaged	GFCI device damaged
Sensor Damaged	Output DC sensor damaged
SCI Damaged	The communication between the two MCU fault
Not Consistent	The datas are not the same of the two MCU
High DC INJ	Output DC Injection Too High
Relay Damaged	Output Relay Failure
High Bus Voltage	DC Bus Voltage Is Too High
Auto test failed	Auto test failed
2.5V Ref Fault	2.5V Reference Voltage Inside has problem

5. Communications

1) Communications software instructions

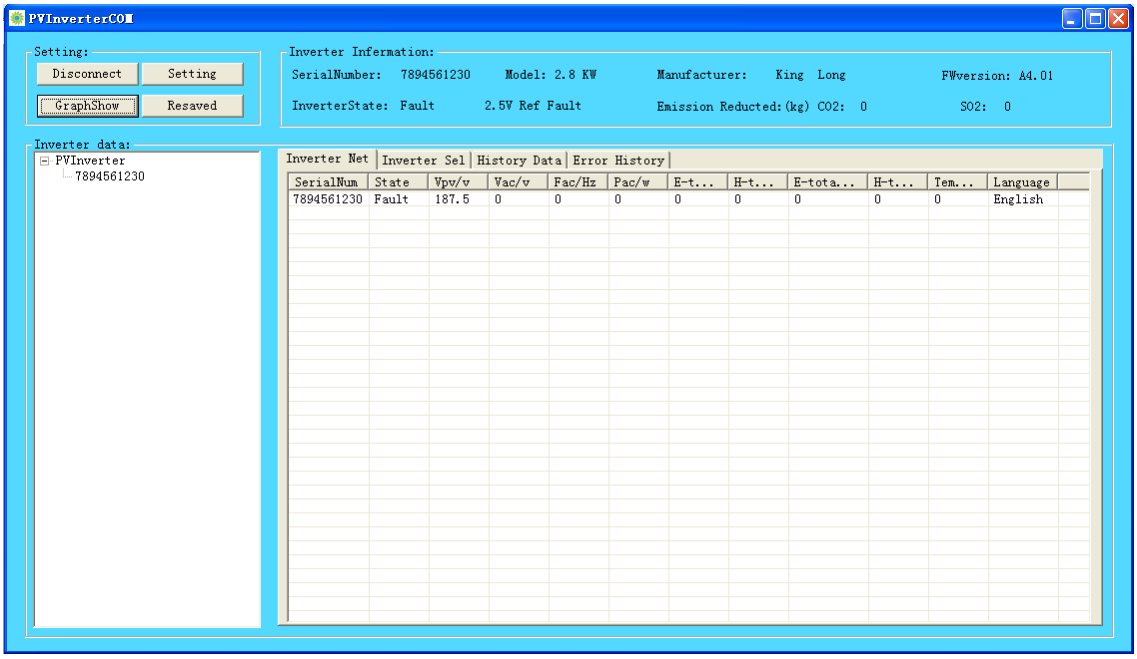
Connect PV Inverter and PC by RS232 wire. Open monitoring software “PV Inverter

COM.exe".If you use "PV Inverter COM.exe", Open the "PV Inverter COM.txt" file in the path :C:\WINDOWS. The file records the user's software and the main parameter settings, click on the main interface and the "Setting" button, enter the password "szddz" into the user settings interface, set the interface as follows based on actual field conditions Click the "Set" button and exit.



2) Monitor

After setting the software the user can monitoring the inverter. The right side of the main interface is the detailed information of inverter.



3) Detailed information

Detailed setting method and other functions refer to "PV Inverter COM Manual." in the CD.

6. Trouble shooting

In most situations, the Inverter requires very little service. However, if Inverter is not able to work perfectly, please refer to the following instructions before calling your local dealer.

- If any problems arise, the red (Fault) LED on the front panel turns on and the LCD displays the relevant information. Please refer to the following table for a list of

potential problems and their solutions.

System Fault	Ground I Fault	1. The ground current is too high. 2. Unplug the inputs from the PV generator and check the peripheral AC system. 3. After the cause is cleared, re-plug the PV panel and check PV-Inverter status. 4. If the problem persists please call service.
	Grid Fault	1. Wait for 5 minutes, if the grid returns to normal, PV-Inverter automatically restarts. 2. Make sure grid voltage and frequency meet the specifications 3. If the problem persists please call service.
	No Utility	1. Grid is not connected. 2. Check grid connection cables. 3. Check grid usability.
Inverter Failure	PV over Voltage	1. Check the open PV voltage, see if it is greater than or too close to 500VDC. 2. If PV voltage is less than 550VDC, and the problem still occurs, please call local service.
	Consistent Fault	1. Disconnect PV (+) or PV (-) from the input, restart the PV-Inverter. 2. If it does not work, call service.

- If there is no display on the panel, please check PV-input connections. If the voltage is higher than 150V, call your local service.
- During periods of little or no sunlight, the PV-Inverter may continuously start up and shut down. This is due to insufficient power generated to operate the control circuits.

7. Specifications

Model / Specifications	CMS 1500	CMS 2000	CMS 2800
Input data			
Max. DC power	1750W	2280W	3160W
Max. DC voltage	450V	500V	500V
PV voltage range MPPT	110V-430V	110V-480V	110V-480V
Max. input current	8.9A	10A	13A
DC voltage ripple	<5%	<5%	<5%
Max. number of strings	1	1	2
Ground fault monitoring	yes	yes	yes
Reverse polarity protection	short-circuit diode	short-circuit diode	short-circuit diode
Output data			
Max. AC power	1650W	2200W	3000W
Nominal AC output	1500W	2000W	2800W
THD of AC current	<3%	<3%	<3%
Grid voltage range	230V	230V	230V
Grid frequency range	50Hz	50Hz	50Hz
Power factor	1	1	1
Short-circuit proofing	yes	yes	yes
Efficiency			
Max. efficiency	95.50%	96.50%	96.50%
Euro ETA	94.50%	95.50%	95.50%
Protection rating	IP/65	IP/65	IP/65
Mechanical			
Width/height/depth(mm)	415/376/125	415/376/125	415/376/125
Weight	14.8KG	14.8KG	14.8KG